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Springer International Publishing AG
2018

Oksanen , S , Lahdenperä , J J & Rämö , J M 2018 , University teaching assistants' metaphors about teachers' role . in Students' and Teachers' Values, Attitudes, Feelings and Beliefs in Mathematics Classrooms : Selected Papers from the 22nd MAVI Conference . Springer International Publishing AG , Cham , pp. 33-42 . https://doi.org/10.1007/978-3-319-70244-5_4

http://hdl.handle.net/10138/303097
https://doi.org/10.1007/978-3-319-70244-5_4

acceptedVersion

MAVI 22

Proceedings of the MAVI 22 Conference,
September 13-15, 2016, Linnaeus University, Växjö, Sweden

UNIVERSITY TEACHING ASSISTANTS' METAPHORS ABOUT TEACHERS' ROLE

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According to Bullough (1991), metaphors can be viewed as a mirror of teachers' professional identity. This article reports what kind of metaphors university teaching assistants (TAs) at the Department of Mathematics and Statistics in the University of Helsinki, Finland use for teacher's role. As a first phase of a longitudinal study, we analysed 35 TAs' metaphors using Beijaard, Verloop, and Vermunt's (2000) model of teacher identity and Metaphor Manual for Implementing this model (Löfström, Poom-Valickis, & Hannula, 2011). Most of the TAs metaphors were categorised as didactics expert or as self-referential. Also sub-categories were analysed, and potential new sub-categories found. The results also suggest that training can have an influence the metaphors TAs use to describe their role as a TA.

INTRODUCTION

Metaphors can be viewed as a mirror of teachers' professional identity (Bullough, 1991). The aim of the current study is to find out what kind of metaphors TAs use to describe their role as a TA.

In many universities, TAs have an important role in mathematics education. They often have more contact with the students than the lecturers of the mathematics courses. For example, in the University of Helsinki, every course has one or more TAs who guide and support the students. Therefore, it is important to study TAs beliefs and practices about teaching and learning mathematics. There is research on various aspects of university mathematics TAs' beliefs and practices (see eg. DeChenne, Enochs, & Needham, 2012; Ellis, 2014; Speer & Wagner, 2009), but there is no prior research on metaphors the TAs use for their role. In this study we examine TAs' beliefs and conceptions about their professional role expressed through metaphors. The aim of the study is to start a longitudinal research project on the TAs working at the Department of Mathematics and Statistics in the University of Helsinki. The results gained in this study enable us to plan and develop further research. The overall goal is to enhance the TA training and practices in the Department of Mathematics and Statistics.

http://dx.doi.org/10.15626/MAVI.2016.xx

ISBN: 978-91-87925-74-0, eISBN: 978-91-88357-34-2

THEORETICAL BACKGROUND

Metaphors serve not only as a research instrument but also as an instructional strategy in teacher education; metaphors work as a tool when creating self-awareness and in-depth discussions of the nature of teachers' roles and their potential impact on students (Poom, Oder, Kislenko, Talts, Elvisto, & Madis, 2014).

Löfström, Hannula, and Poom-Valickis (2010) concluded that metaphors can provide a fruitful starting point for exploring underlying beliefs and unconscious assumptions. Teachers' beliefs about mathematics, its learning and teaching are considered an indicator for certain behaviors in teaching. Richardson (1996) lists three categories of experience that influence knowledge and beliefs about teaching: personal influence, schooling and formal knowledge. Skott (2015) reports what aspects seem to have influence on beliefs according to previous research; personal life, practicum, schooling, work with colleagues, theoretical part of pre-service education and teacher development programme have an influence on the process of interpretation and construction on teachers' beliefs about mathematics, teaching and learning of mathematics and one self as a "mathematics person".

Tobin (1990) summarizes that beliefs about teaching and learning are associated with teaching roles, and metaphors are used to conceptualize these roles. A metaphor used to conceptualize a role can be changed in a process of changing the role, and new beliefs for a teaching role emerge when the role is reconceptualized.

Metaphor categories

In the literature, there are two approaches for categorizing teacher metaphors: a data driven approach assumes no a priori categories and builds the categories following the grounded theory approach; the theory driven approach uses a pre-existing system of categories and tries to categorize each metaphor into one of these.

The theory driven approach was used by Löfström, Anspal, Hannula, & Poom-Valickis (2010) when they studied metaphors about 'the teacher'. They based the categorization on Beijaard's et al. (2000) model of teacher identity according to which teachers' professional identity can be described in terms of *teacher as a subject matter expert*, *teacher as a pedagogical expert*, and *teacher as a didactical expert*. Their results indicate that the model by Beijaard and colleagues (2000) can be applied as an analytical frame of reference when examining metaphors, but that it would be useful to develop and expand the model further to include metaphors categorized as *self-referential* and *contextual metaphors.*

In this study we use the Metaphor manual by Löfström et al. (2011) to analyse teachers' metaphors for their profession. We chose this model, because it has been tested by Oksanen & Hannula (2012) and Oksanen, Portaankorva-Koivisto & Hannula (2014). The categories are:

Teacher as subject expert. This dimension of teacher identity highlights a profound knowledge base in his subject(s). Typical metaphors in the subject expert category describe the teacher as a source of knowledge. For example: *a book, a radio, a computer*.

Teacher as didactics expert. The teacher is a person who skilfully plans and manages learning process, as a person who knows how to teach specific subject-related content so as to support pupils' learning. For example: *a coach, a conductor, an engine, a road-map, a lighthouse.*

Teacher as pedagogical expert. The teacher is seen as someone who supports the child's development as a human being. The understanding of human thought, behavior, and communication are essential elements in the teacher's pedagogical knowledge base. For example: *a mother, an older brother, a firm tree.*

Self-referential metaphors. These metaphors describe features or characteristics of the teacher's personality, with reference to the teacher's characteristics (self-referential) without reference to the role or task of the teacher. For example: *a machine, a candle, a sunshine, a camel.*

Contextual metaphors. These metaphors describe features or characteristics of the teacher's work or work environment, or in other ways refer to characteristics of the environment (contextual). One might say that the metaphors describe where (physically, socially and organizationally) or in what kind of setting or environment the teacher works. For example: *a king or an actor, slave*.

Hybrids. These metaphors include elements of more than just one of the above categories.

Unidentified. Metaphors that could not be categorized in any of the categories presented above.

Teaching assistants at the Department of Mathematics and Statistics

The Department of Mathematics and Statistics at the University of Helsinki is the biggest department in its field in Finland with over 1 300 students. Typical undergraduate courses have 100–400 students. In the autumn 2015 the department had 60 TAs who were either undergraduate students, master's degree students, doctoral students or members of the staff.

The TAs have varied duties. Some TAs are affiliated with a lecture course, and meet with a group of 20–30 students in a weekly tutorial. In the tutorials, problems solved by the students are discussed, and typically the students take turns in explaining their solutions on a blackboard. Other teaching assistants teach in drop-in sessions where the students can come and ask for help with any mathematical problems they have. Most of the tutorial and drop-in session TAs have a brief, voluntary training in the be-

ginning of semester. In this study, these two types of TAs are referred as traditional TAs.

Since 2011, a fairly new teaching method, Extreme Apprenticeship (XA), has been used on many undergraduate courses. (For a detailed description of the method, see eg. Rämö, Oinonen & Vikberg, 2015.) In XA, the role of the TAs is to offer guidance to the students in a collaborative learning space where the students can spend as much time as they want. They lead the student subtly towards the discovery of a solution through a process of questioning and listening. Some of the weekly tasks are selected for inspection each week, and the TAs give written feedback on the students' solutions. During the course, the TAs go through a training by taking part in weekly meetings in which pedagogical aspects of their work is discussed. The recruitment process of the XA TAs includes an interview to ensure that they are interested in pedagogy and have motivation to teach.

RESEARCH QUESTIONS

- What kind of metaphors do university teaching assistants use for describing their role as a teacher?
- How do the metaphors given by traditional TAs and XA TAs differ?

METHODOLOGY

Instrument

The questionnaire for this longitudinal research concerning TAs practices and beliefs at the Department of Mathematics and Statistics was built in autumn 2015. As a part of this survey TAs were asked to provide a metaphor characterizing the teacher's role. The respondents were prompted with the beginning of a statement: "*As a teaching assistant I am like…".* They were also asked to add a brief explanation of their metaphor. This part was adapted from the questionnaire used in Nordic-Baltic Comparative Research in Mathematics Education. The TAs were also asked to give some background information concerning their academic experience and teaching experience.

Procedure and sample

The data was collected during the feedback meeting of TAs in December 2015. There were 24 TAs present, and it took 30-45 minutes for them to fill in the questionnaire with tablets in the beginning of the meeting. The questionnaire was sent via e-mail to those TAs who were not present. In total, the questionnaire was given to 57 teaching assistants. The answer rate was 63%, giving n=36. Of the respondents, 35 gave permission to use their answers.

Analyses

The analysis of the metaphors in the present study encompassed the following stages and actions: (1) The metaphor manual (Löfström et al., 2011) was read to guide the

coding process; it consisted of explanations of categories and concrete examples of metaphors. (2) Two independent raters judged first the metaphor categories on a case-to-case basis. The metaphors and their explanations were analyzed as a unit, as the metaphor itself may be used to express different meanings. The raters analyzed the metaphors "from pure towards complex". (3) The codings of two independent raters were compared at the end. (4) In those cases where the metaphor was categorized completely identically, that category became the final category (65.5% of the cases, 23/35). (5) If the metaphors were coded partly identically and if the unit of analysis contained elements of two or more aspects, the one commonly used category used by both raters became the final category (26% of the cases, 9/35). (6) If two raters coded differently, a third rater was used and when at least two coders agreed on coding, their coding was recorder (8.5% of the cases, 3/35). (7) If both raters used two or more same categories, were these metaphors classified as hybrids (8.5% of the cases, 3/35). (8) If the raters used different categories or the metaphor could not be identified in any category, were these metaphors removed (0%).

To analyze qualitative data and form sub-categories, we used theoretical thematic analysis (Braun & Clarke, 2006, 2012). The stages in our analysis were: (1) become familiar with the data, (2) generate initial codes, (3) search for themes, (4) review themes, (5) define and name themes, and (6) produce the report. The theme analysis was carried out by one author of this paper and the two authors of this paper compared the findings at the end.

RESULTS

TAs' background and teaching experience

There were 17 (49%) XA TAs and 18 (51%) traditional TAs. Of the XA TAs, 53 % had mathematics as their major subject, and 47 % were majoring in mathematics education. The majority of traditional TAs (72%) were mathematics majors.

The academic experience of traditional TAs (3 doctors, 6 doctoral students, 9 undergraduate or master's students) was more advanced when compared with XA TAs (1 doctoral student, 16 undergraduate or master's students). Traditional TAs had also more experience in teaching university mathematics. TAs' prior teaching experience is presented in detail in Table 1.

		Previous university mathematics teaching experience				Other teaching experience
	#	None	<1 year	1-2 years	>2 years	
XA TA	17	35%	24 %	41%	0%	71%
Traditional TA	18	17%	17%	39%	28%	28%

Table 1: The previous teaching experience of XA TAs and traditional TAs.

Metaphors

The most common metaphors used were categorised as didactics expert (40%) or as self-referential (38%); almost 80% of the metaphors were in either of these two categories. There were three metaphors in the pedagogical expert category and five hybrid metaphors that consisted of elements from two different metaphor categories. The categories included in hybrid metaphors were *subject expert, didactics expert, pedagogical expert* and *self-referential*. Hence, the *subject expert* category was present only in hybrid form. There were no metaphors in *contextual category*. The distribution of metaphor categories is presented in Table 2.

n	Subject expert	Didactics expert	Pedagogical expert	Self-referential	Contextual	Hybrids
35	0	14 (40%)	3 (9%)	13 (37%)	0	5 (14%)

Table 2: The distribution of metaphors.

In the following sub-category analysis, the *hybrid* metaphors are included in both of their categories.

Metaphors describing teacher as *didactics experts* can be classified into two subcategories: *active* (10/17, 59%) and *passive* (7/17, 41%). The *active didactics expert* metaphors describe teachers who are present in the learning situation and are striving for better results both in teaching and learning (eg. *A multifunction device. As a teaching assistant, I try to adapt to the student's way of thinking and the instruction situation, I approach the task in several different ways if I cannot get on the same wavelength with the student.*). *The passive didactics expert* metaphors describe teachers who are there to support the learners when needed (eg. *A caretaker. I ensure that the student has the required (mental state) for learning, the necessary equipment and a presence of support so that they can learn and find out by themselves.*).

A closer analysis of the *self-referential* metaphors shows that there are five subcategories present: *life-long learning* (4/16, 25%), *variability of mathematics teachers' job* (1/16, 6%), *persistence, bile or suitability to the job* (3/16, 19%), *mathematics teacher from student's perspective* (5/16, 31%) and *humour* (3/16, 19%). Two of these subcategories are new and not present in Oksanen et al. (2014), namely *mathematics teacher from student's perspective* (e.g. *A gentle and wise bear. I might be a little scary, but then the students notice that I am a teddy bear. In addition, sometimes I do disservices by giving too much advice*) and *humour* (e.g. *An analytic function. I obtain my maximum at the boundary*). On the other hand, there are no metaphors in *the big amount of work* subcategory, which, in contrary, was present in Oksanen et al. (2014).

The metaphor category distribution for traditional TAs and XA TAs is presented in Figure 1. Traditional TAs gave more self-referential metaphors than XA TAs, and all metaphors in the pedagogical expert category were given by XA TAs.

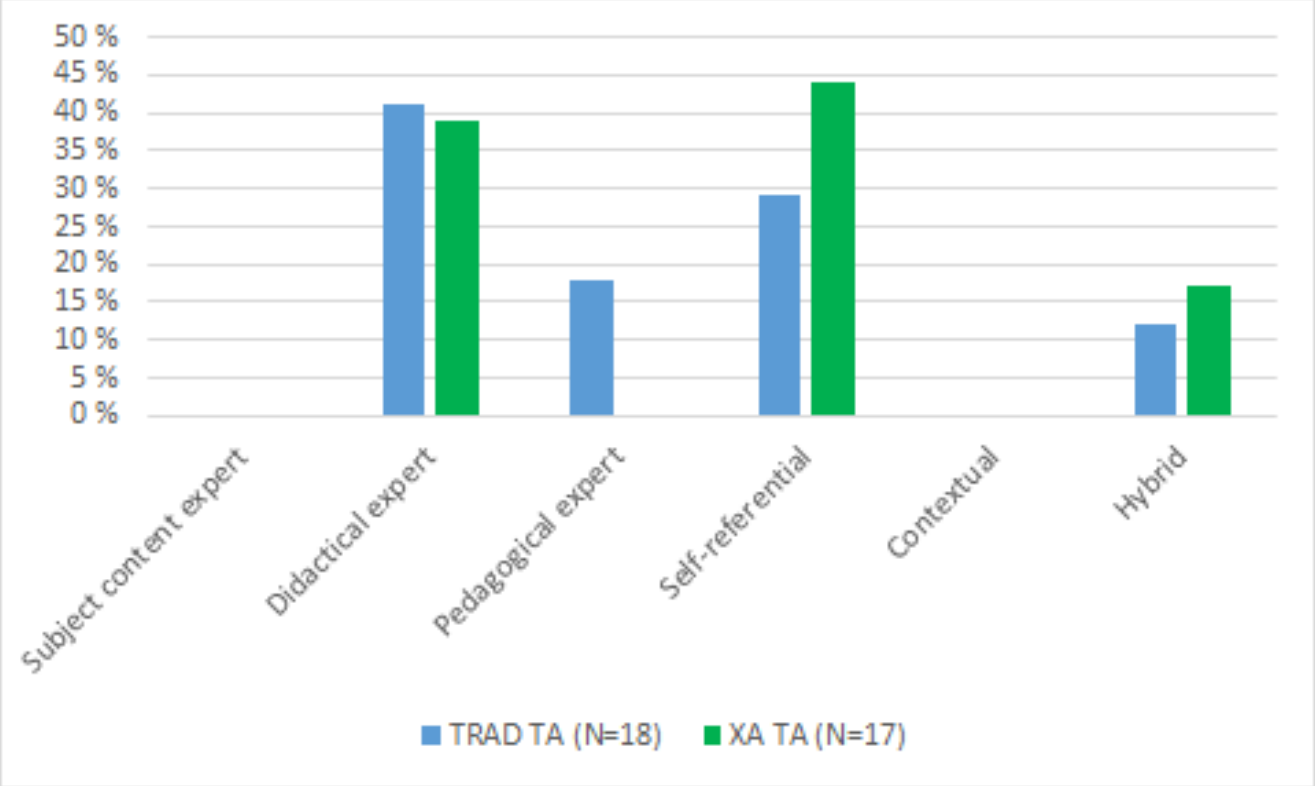

Figure 1. Metaphor category distribution for traditional TAs and XA TAs.

In the hybrid category, the metaphors given by traditional TAs were from the categories subject content expert, didactical expert, pedagogical expert and self-referential. The hybrid metaphors given by XA TAs were from the categories subject content expert, didactical expert and pedagogical expert.

DISCUSSION

In this study we asked TAs to fill in the following sentence: "As a teaching assistant I am like…". In 89% of the cases the two independent raters used completely identical or partly identical categories. This result indicates that the metaphors are sometimes very complex and difficult to analyse.

When categorising the metaphors, it was important to analyse not only the metaphor but also the provided explanation. However, this type of question might give a limited view of the TAs' beliefs of their role as a TA as they need to choose only one metaphor. On the other hand, the posing of the question could result in a more focused answer. The method needs to be further validated with interviews and focus group discussions in order to find out the nature of the methods' limitations.

When looking at the TAs' metaphors, there were no metaphors found in categories teacher as subject expert. This is surprising, as one would think that in university mathematics context subject expertise would be emphasised by the TAs. As this research project started only last autumn, the sample was small (n=35). Further research is needed to find out if TAs provide any metaphors in these categories or if the findings of this study were just a coincidence.

Another category that did not occur in this study was contextual metaphors. In previous studies, school teachers have provided contextual metaphors that describe their dissatisfaction with their job; they see their job too demanding or multifunctional (Oksanen et al., 2014). The metaphors in this sample do not suggest that the context where the TAs work would raise negative or positive feelings. One reason explaining this difference could be that the TAs' work is usually temporary, and they are not as engaged with it as school teachers. Therefore the problems rising from they work might not burden TAs as much as school teachers.

When looking deeper into the subcategories of the self-referential metaphors, the results indicate that the TAs' self-referential metaphors do not reflect much hesitation or doubt on their suitability to the job. This seems natural as for most of the TAs teaching is not their main job, and they do not need to be as committed as school teachers. When looking at the TAs self-referential metaphors and their sub-categories, two new categories were found: mathematics teacher from student's perspective (31%) and humour (19%). Further needs to be done to find out if any new sub-categories appear.

When looking at the didactical metaphors, 41% of the TAs gave a passive didactical metaphor. Oksanen et al. (2014) report that pre-service teachers gave 37% and in-service teachers 30% of their didactical metaphors in a passive tense. This could be explained by the fact that 72% of the TAs are still undergraduate or master's students and don't have much experience in teaching.

There are some differences when it comes to the metaphors given by the traditional TAs and XA TAs. Traditional TAs give more self-referential metaphors, and XA TAs give more metaphors in the pedagogical expert category. These differences could be explained by the more intensive training the XA TAs receive, in which pedagogical aspects of their work are emphasised. Also, the XA TAs are interviewed before they hired to ensure that they interested in pedagogy and have motivation to teach. This can result in them giving more metaphors in the pedagogical expert category.

In previous studies, in-service teachers have given more metaphors in didactical expert and pedagogical expert categories than pre-service teachers (Oksanen et al., 2014). This suggests that these two categories are emphasised when a teacher gains more experience. In this light, it is interesting that in our study, the traditional TAs are more experienced than XA TAs, but they do not give more metaphors belonging to the didactical and pedagogical expert categories.

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